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Document	Image pages	Text pages	Error pages
US 6583806 B2	0	1	0
Total	0	1	0

tion, factory floor, etc.).

(77) A portable laptop implementation can be made to deliver multimedia mail with video, audio and synchronized annotations via CD-ROM or an add-on videotape unit with separate video, audio and time code tracks (a stereo videotape player can use the second audio channel for time code signals). Videotapes or CD-ROMs can be created in main offices and express mailed, thus
avoiding the need for high-bandwidth networking when on the road. Cellular phone links can be used to obtain both voice and data communications (via modems). Modem-based data communications are sufficient to support remote control of mail or presentation playback, annotation, file transfer and fax features. The laptop can then be brought into the office and attached to a docking station where the available MLAN 10 and additional functions adapted from Add-on box 800 can be supplied, providing full CMW capability.

(78) COLLABORATIVE MULTIMEDIA WORKSTATION SOFTWARE

(79) CMW software modules 160 are illustrated generally in FIG. 20 and discussed in greater detail below in conjunction with the software running on MLAN Server 60 of FIG. 3. Software 160 allows the user to initiate and manage (in conjunction with the server software) videoconferencing, data conferencing, multimedia mail and other collaborative sessions with other users across the network.

(80) Also present on the CMW in this embodiment are standard multitasking operating system/GUI software 180 (e.g., Apple Macintosh System 7, Microsoft Windows 3.1, or UNIX with the "X Window System" and Motif or other GUI "window
manager" software) as well as other applications 170, such as word processing and spreadsheet programs. Software modules 161-168 communicate with operating
system/GUI software 180 and other applications 170 utilizing standard function calls and interapplication protocols.

(81) The central component of the Collaborative Multimedia Workstation software is the Collaboration Initiator 161. All collaborative functions can be accessed through this module. When the Collaboration Initiator is started, it exchanges initial configuration information with the Audio Video Network Manager (AVNM) 60 (shown in FIG. 3) through Data Network 902. Information is
also sent from the Collaboration Initiator to the AVNM indicating the location of the user, the types of services available on that workstation (e.g.,

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Time: 09:28

Document Listing

Document	Image pages	Text pages	Error pages
US 6583806 B2	0	1	0
Total	0	1	0

(via the ADD
button in Collaboration Initiator window 204) to provide additional information regarding the factual history of the security. Upon selecting the ADD button, video window 203 now displays, as illustrated in FIG. 38, a video mosaic consisting of three smaller images (instead of a single large image displaying only caller 231) of the Expert 233, caller 231 and London expert 232.

(225) During this videoconference, an urgent PRIORITY request (New Call window 234) is received from the Expert's boss (who is engaged in a three-party videoconference call with two members of the bank's operations department and is attempting to add the Expert to that call to answer a quick question). The Expert puts his three-party videoconference on hold (merely by clicking the HOLD button in video window 203) and accepts (via the ACCEPT button of New Call
window 234) the urgent call from his boss, which results in the Expert being added to the boss' three-party videoconference call.

(226) As illustrated in FIG. 39, video window 203 is now replaced with a four-person video mosaic representing a four-party conference call consisting of the Expert 233, his boss 241 and the two members 242 and 243 of the bank's operations department. The Expert quickly answers the boss' question and, by clicking on the RESUME button (of video window 203) adjacent to the names of the other participants to the call on hold, simultaneously hangs up on the conference call with his boss and resumes his three-party conference call involving the securities issue, as illustrated in video window 203 of FIG. 40.

(227) While that call was on hold, however, analyst 231 and London expert 232 were still engaged in a two-way videoconference (with a blackened portion of the video mosaic on their screens indicating that the Expert was on hold) and had shared and annotated a graphical image 250 (see annotations 251 to image 250 of FIG. 40) illustrating certain financial concerns. Once the Expert resumed the call, analyst 231 added the Expert to the share session, causing Share window 211 containing annotated image 250 to appear on the Expert's screen. Optionally, snapshot sharing could progress while the video was on hold.

(228) Before concluding his conference regarding the securities, the Expert receives notification of an incoming multimedia mail message--e.g., a beep accompanied by the appearance of an envelope 252 in the dog's mouth in In Box
icon 205 shown in FIG. 40. Once he concludes his call, he quickly scans his incoming multimedia mail message by clicking on In Box icon 205, which invokes

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Date: 06/21/2004
Time: 09:27

Document Listing

Document	Image pages	Text pages	Error pages
US 6583806 B2	0	1	0
Total	0	1	0

IG. 18A. Currently available personal computers (e.g., an Apple Macintosh or an IBM-compatible PC, desktop or laptop) and workstations (e.g., a Sun SPARCstation) can be adapted to work with the present invention to provide such
features as real-time videoconferencing, data conferencing, multimedia mail, etc. In business situations, it can be advantageous to set up a laptop to operate with reduced functionality via cellular telephone links and removable storage media (e.g., CD-ROM, video tape with timecode support, etc.), but take on full capability back in the office via a docking station connected to the MLAN 10. This requires a voice and data modem as yet another function server attached to the MLAN.

(60) The currently available personal computers and workstations serve as a base workstation platform. The addition of certain audio and video I/O devices to the standard components of the base platform 100 (where standard components
include the display monitor 200, keyboard 300 and mouse or tablet (or other pointing device) 400), all of which connect with the base platform box through standard peripheral ports 101, 102 and 103, enables the CMW to generate and receive real-time audio and video signals. These devices include a video camera 500 for capturing the user's image, gestures and surroundings (particularly the user's face and upper body), a microphone 600 for capturing the user's spoken words (and any other sounds generated at the CMW), a speaker
700 for presenting incoming audio signals (such as the spoken words of another participant to a videoconference or audio annotations to a document), a video input card 130 in the base platform 100 for capturing incoming video signals (e.g., the image of another participant to a videoconference, or videomail), and a video display card 120 for displaying video and graphical output on monitor 200 (where video is typically displayed in a separate window).

(61) These peripheral audio and video I/O devices are readily available from a variety of vendors and are just beginning to become standard features in (and often physically integrated into the monitor and/or base platform of) certain personal computers and workstations. See, e.g., the aforementioned BYTE article ("Video Conquers the Desktop"), which describes current models of Apple's Macintosh AV series personal computers and Silicon Graphics' Indy workstations.

(62) Add-on box 800 (shown in FIG. 18A and illustrated in greater detail in FIG. 19) integrates these audio and video I/O devices with additional functions (such as adaptive echo canceling and signal switching) and interfaces with AV Network 901. AV Network 901 is the part of the MLAN 10 which carries

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UserID: KFerguson
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Date: 06/21/2004
Time: 09:10

Document Listing

Document	Image pages	Text pages	Error pages
US 20040107255	0	1	0
Total	0	1	0

esponse thereto, the AVNM causes the A/V Switching Circuitry 30 to set up the appropriate connections between ports 81 and 82, as indicated by the dashed line 83.

[0152] FIG. 25 diagrammatically illustrates how two-party calls are connected for CMWs WS-1 and WS-2 when located in different MLANs 10a and 10b. As illustrated in FIG. 25, CMW WS-1 of MLAN 10a is connected to a port 91a of A/V
Switching Circuitry 30a of MLAN 10a, while CMW WS-2 is connected to a port 91b
of the A/V Switching Circuitry 30b of MLAN 10b. It will be assumed that MLANs 10a and 10b can communicate with each other via ports 92a and 92b (through respective WAN gateways 40a and 40b and WAN 15). A call between CMWs WS-1 and
WS-2 can then be established by AVNM of MLAN 10a in response to the creation of
callhandles at ports 91a and 92a, setting up appropriate connections between these ports as indicated by dashed line 93a, and by AVNM of MLAN 10b, in response to callhandles created at ports 91b and 92b, setting up appropriate connections between these ports as indicated by dashed line 93b. Appropriate paths 94a and 94b in WAN gateways 40a and 40b, respectively, are set up by the
WAN network manager 65 (FIG. 21) in each network.

Conference Calls

[0153] Next to be described is the specific manner in which the preferred embodiment provides for multi-party conference calls (involving more than two participants) When a multi-party conference call is initiated, the CMW provides a screen that is similar to the screen for two-party calls, which displays a live video picture of the callee's image in a video window. However, for multi-party calls, the screen includes a video mosaic containing a live video picture of each of the conference participants (including the CMW user's own picture), as shown, for example, in FIG. 8B. Of course, other embodiments could show only the remote conference participants (and not the local CMW user)
in the conference mosaic (or show a mosaic containing both participants in a two-party call). In addition to the controls shown in FIG. 8B, the multi-party conference screen also includes buttons/menu items that can be used to place individual conference participants on hold, to remove individual participants from the conference, to adjourn the entire conference, or to provide a "close-up" image of a single individual (in place of the video mosaic).

Printed by EAST

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Date: 06/21/2004
Time: 09:13

Document Listing

Document	Image pages	Text pages	Error pages
US 20040107255	0	1	0
Total	0	1	0

es. Also note that Site #2 and Site #3 are each
required to transmit two different types of cut-and-paste mosaics.

[0100] The preferred embodiment also provides the capability of allowing a conference participant to select a close-up of a participant displayed on a mosaic. This capability is provided whenever a full individual video picture is available at that user's site. In such case, the A/V Switching Circuitry 30 (FIG. 3) switches the selected full video picture (whether obtained locally or from another site) to the CMW that requests the close-up.

[0101] Next to be described in connection with FIGS. 18A, 18B, 19 and 20 are various preferred embodiments of a CMW in accordance with the invention.

Collaborative Multimedia Workstation Hardware

[0102] One embodiment of a CMW 12 of the present invention is illustrated in FIG. 18A Currently available personal computers (e.g., an Apple Macintosh or an
IBM-compatible PC, desktop or laptop) and workstations (e,g., a Sun SPARC station) can be adapted to work with the present invention to provide such features as real-time videoconferencing, data conferencing, multimedia mail, etc. In business situations, it can be advantageous to set up a laptop to operate with reduced functionality via cellular telephone links and removable storage media (e.g., CD-ROM, video tape with timecode support etc.), but take on full capability back in the office via a docking station connected to the MLAN 10. This requires a voice and data modem as yet another function server attached to the MLAN.

[0103] The currently available personal computers and workstations serve as a base workstation platform. The addition of certain audio and video I/O devices to the standard components of the base platform 100 (where standard components
include the display monitor 200, keyboard 300 and mouse or tablet (or other pointing device) 400), all of which connect with the base platform box through standard peripheral ports 101, 102 and 103, enables the CMW to generate and receive real-time audio and video signals. These devices include a video camera 500 for capturing the user's image, gestures and surroundings (particularly the user's face and upper body), a microphone 600 for capturing the user's spoken words (and any other sounds generated at the CMW), a speaker
700 for presenting incoming audio signals (such as the spoken words of another participant to a videoconference or audio annotations to a document), a video input card 130

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Computer: WS07515
Date: 06/21/2004
Time: 09:13

Document Listing

Document	Image pages	Text pages	Error pages
US 20040107255	0	1	0
Total	0	1	0

Side Mount 850 eliminates
the necessity of external connections to these integrated audio and video I/O devices, and includes an LCD display 810 for displaying the incoming video signal (which thus eliminates the need for a base platform video input card 130).

[0119] Given the proximity of Side Mount device 850 to the user, and the direct access to audio/video I/O within that device, various additional controls 820 can be provided at the user's touch (all well within the capabilities of those skilled in the art). Note that, with enough additions, Side Mount unit 850 can become virtually a standalone device that does not require a separate computer for services using only audio and video. This also provides a way of supplementing a network of full-feature workstations with a few low-cost additional "audio video intercoms" for certain sectors of an enterprise (such as clerical, reception, factory floor, etc.).

[0120] A portable laptop implementation can be made to deliver multimedia mail with video, audio and synchronized annotations via CD-ROM or an add-on videotape unit with separate video, audio and time code tracks (a stereo videotape player can use the second audio channel for time code signals). Videotapes or CD-ROMs can be created in main offices and express mailed, thus
avoiding the need for high-bandwidth networking when on the road. Cellular phone links can be used to obtain both voice and data communications (via modems) Modem-based data communications are sufficient to support remote control of mail or presentation playback, annotation, file transfer and fax features. The laptop can then be brought into the office and attached to a docking station where the available MLAN 10 and additional functions adapted from Add-on box 800 can be supplied, providing full CMW capability.

Collaborative Multimedia Workstation Software

[0121] CMW software modules 160 are illustrated generally in FIG. 20 and discussed in greater detail below in conjunction with the software running on MLAN Server 60 of FIG. 3 Software 160 allows the user to initiate and manage (in conjunction with the server software) videoconferencing, data conferencing, multimedia mail and other collaborative sessions with other users across the network.

[0122] Also present on the CMW in this embodiment are standard multitasking operating system/GUI software 180 (e.g., Apple Macintosh System 7, Microsoft Windows 3.1, or UNIX with the "X Window System" and Motif or other GUI "window

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Date: 06/21/2004
Time: 09:26

Document Listing

Document	Image pages	Text pages	Error pages
US 6583806 B2	0	1	0
Total	0	1	0

ine 93a, and by AVNM of
MLAN 10b, in response to callhandles created at ports 91b and 92b, setting up appropriate connections between these ports as indicated by dashed line 93b. Appropriate paths 94a and 94b in WAN gateways 40a and 40b, respectively are set
up by the WAN network manager 65 (FIG. 21) in each network.

(115) CONFERENCE CALLS

(116) Next to be described is the specific manner in which the preferred embodiment provides for multi-party conference calls (involving more than two participants). When a multi-party conference call is initiated, the CMW provides a screen that is similar to the screen for two-party calls, which displays a live video picture of the callee's image in a video window. However, for multi-party calls, the screen includes a video mosaic containing a live video picture of each of the conference participants (including the CMW user's own picture), as shown, for example, in FIG. 8B. Of course, other embodiments could show only the remote conference participants (and not the local CMW user) in the conference mosaic (or show a mosaic containing both participants in a two-party call). In addition to the controls shown in FIG. 8B, the multi-party conference screen also includes buttons/menu items that can be used to place individual conference participants on hold, to remove individual participants form the conference, to adjourn the entire conference, or to provide a "close-up" image of a single individual (in place of the video mosaic).

(117) Multi-party conferencing requires all the mechanisms employed for 2-party calls. In addition, it requires the conference bridge manager CBM 64 (FIG. 21) and the conference bridges 36 (FIG. 3). The CBM acts as a client of the AVNM in managing the operation of the conference bridges 36. The CBM also
acts a server to other clients on the network. The CBM makes conferencing services available by creating service records of type "conference" in the AVNM service database and associating these services with the ports on A/V Switching Circuitry 30 for connection to conference bridges 36.

(118) The preferred embodiment provides two ways for initiating a conference call. The first way is to add one or more parties to an existing two-party call. For this purpose, an ADD button is provided by both the Collaboration Initiator and the Rolodex, as illustrated in FIGS. 2A and 22. To add a new party, a user selects the party to be added (by clicking on the user's rolodex name or face icon as described above) and clicks on the ADD button to invite that new party. Additional parties can be invited in a similar manner. The